

Diagnosis of Tuberculosis in District Sudhnuti, Azad Jammu and Kashmir

ABSTRACT

Globally, tuberculosis (TB) is a major health risk that is mostly caused by *Mycobacterium tuberculosis*, a member of the *Mycobacterium Tuberculosis Complex* (MTC). Ten million cases of tuberculosis and 1.3 million deaths from the disease occur each year, making *Mycobacterium tuberculosis* one of the leading causes of death globally. Pakistan is ranked fifth among high-burden countries for tuberculosis (TB) and is expected to rank fourth for the prevalence of multi-drug resistant (MDR) TB. As a result, tuberculosis poses a serious threat to public health in Pakistan. Tuberculosis has a common occurrence in Azad Jammu and Kashmir.

Aims: The aim of current study was to find out the prevalence of tuberculosis in the defined population.

Study design: The study was conducted in District and Tehsil Headquarter Hospitals of District Sudhnuti AJK.

Place and Duration of Study: Samples were collected from all the District and Tehsil Headquarter Hospitals of district Sudhnuti from January 2019 to December 2019.

Methodology: Samples of sputum from suspected cases were gathered from district Sudhnuti hospitals and TB centers from January 2019 to December 2019. All the suspected cases were examined by sputum smear microscopy and then bacteriologically positive cases were further confirmed by GeneXpert. All positive cases were examined for multi-drug resistant by using GeneXpert.

Results: In current study during year 2019, 201 TB cases were reported from district Sudhnuti out of which 107 (53.23%) were males and 94 (46.76%) were females. The value of $P=0.51$ that is >0.05 is none significant shows that Tuberculosis has no selective effect on specific gender. Pulmonary cases were 131 in number with 81 bacteriologically positive and 50 clinically diagnosed negative cases. Extra Pulmonary cases were 70 in number with 1 bacteriologically positive and 69 clinically diagnosed negative cases. Only 2 (0.99%) MDR cases were diagnosed and the case notification rate during 2019 was 66.

Conclusion: The current study shows that males are more prone to TB in district Sudhnuti AJK as compared to females. The individuals with age >64 are more susceptible to TB as compared to individuals with age <15 . The CNR during 2019 is 66 that is far away from WHO set criteria. The CNR indicates that there is need of improvement in surveillance system.

Keywords: Tuberculosis; Multi Drug Resistance Tuberculosis; Case Notification Rate; Male to Female Ratio; Contact Tracing.

1. INTRODUCTION

Globally, tuberculosis (TB) is a major health risk that is mostly caused by *Mycobacterium tuberculosis*, a member of the *Mycobacterium Tuberculosis Complex* (MTC) [1, 2]. Since ancient times, tuberculosis has been known by several names in many historical eras and nations. Its core characteristics, notably its deteriorating impact and destructive character, have always been known, despite the fact that it has frequently been perplexed with certain other disorders. TB affects not just one organ but also a number of organs and tissues in the body [3]. Humanity has

witnessed the transformation of tuberculosis (TB) from an incurable illness to a treatable one [4]. The worldwide persistence of tuberculosis is mostly due to poverty. There are some people who would view it as a social disease with potential health risks [5]. Ten million cases of tuberculosis and 1.3 million deaths from the disease occur each year, making *Mycobacterium tuberculosis* one of the leading causes of death globally [6, 7]. Pakistan is ranked fifth among high-burden countries for tuberculosis (TB) and is expected to rank fourth for the prevalence of multi-drug resistant (MDR) TB [8, 9]. Tuberculosis poses a serious threat to public health in Pakistan [10]. Azad Jammu and Kashmir (AJK) is an independent state in Pakistan with 4.045 million people living there as of the Planning and Development Department's 2017 census, which yielded an 88:12 rural-urban ratio [11]. Tuberculosis imposes a serious health concern in AJK. According to WHO guidelines for 2014, the incidence rate of tuberculosis (TB) in AJK is 270 per 100,000, a significantly higher rate than in other developing nations [12]. It is impossible to control tuberculosis (TB) without establishing a reliable surveillance system that can track the progression of the disease and evaluate the effects of control efforts on the disease [13]. Surveillance system in AJK does not meet WHO criteria. The main focus of the study is case notification as the essential strategy for tuberculosis prevention and treatment. Data analysis shows that each TB patient infects about 10 people a year on average, and that the case detection rate in nearly all AJK districts is just 46% of their targets [12]. There is no previous study on the prevalence of tuberculosis in district Sudhnuti AJK. The aim of this research is to ascertain the tuberculosis prevalence rates in the district of Sudhnuti, AJ&K. The purpose of this study is to reveal the prevalence and diagnosis of tuberculosis in district Suhnuti AJK during year 2019.

2. MATERIAL AND METHODS

2.1 Study Area

The current study was conducted in district Sudhnuti one of ten districts of AJK, falls within the Poonch division, characterized by hills, mountains, small valleys, and plains, covering a total area of approximately 5695 km². District Sudhnuti is approximately 100 km away from Rawalpindi and Islamabad, located in Pirpunjal region. It comprises of four Tehsils (Pallandri, Mong, Balauch and Tarrar Khal). The current study is hospital based study which was conducted from January 2019 to December 2019. For the purpose of sampling tuberculosis patients, surveys were conducted in the Tehsil head quarter (THQ) and the District head quarter (DHQ) hospitals of district Sudhnuti.

2.2 Sample Collection, Slide Preparation and Observation

Samples of sputum from suspected cases were gathered from district Sudhnuti hospitals and TB centers. Direct preparation of smears from clinical specimens was done. The sputum containers were placed in an ordered manner. Sputum receptacles were obtained, opened in accordance with the slide number, and then the sputum was spread by continuous rotation across the center of the slides using a wood stick. The smear was 20 mm by 10 mm in size. After that, slides were placed on an air dryer so that the smeared side was facing up, and they air dried for roughly half an hour. Using forceps, the dry smears were fixed by passing them over the flame for approximately 4 seconds while holding them smear side up. The slides were arranged in a serial manner on the staining rack, with a 1-cm space between each smeared side. Following that, slides were covered with Ziehl's Nelson 1% carbol-fuchsin solution and heated using a Bunsen burner from below until vapors began to rise. To get rid of extra carbol-fuchsin, slides were rinsed with water after five minutes. Almost all of the red color on the slides vanished when they were cleaned with a 25% sulfuric acid solution and left for three minutes. The sulfuric acid was gently washed to remove excess stain. The excess rinsing water was also removed from the slides. The 0.1% methylene blue counterstaining solution was applied to each slide separately, and the slides were let to stand for one minute. Slides were allowed to air dry after each one was thoroughly cleaned with water and drained. A drop of immersion oil was added to the stained smear after it

had air dried, and the 100x objective lens was used to focus it under a microscope. Acid-fast bacilli varied widely in morphology from short, coccoid to elongated filaments; they were either uniformly or irregularly stained. They were bright red or pink against the blue counter-stained background. The confirmation of all bacteriologicalley positive TB cases was also done by using GeneXpert.

3. RESULTS

In year 2019, 201 cases were reported from four tehsils of district Sudhnuti, 54 (26.86%) in tehsil Baluch, 8 (3.98%) in tehsil Mong, 90 (44.77%) in tehsil Pallandri and 49 (24.37%) in tehsil Tarar Khal. Out of 201 cases 186 (92.53%) were new cases, 5 (2.48%) were relapse cases and 4 (1.99%) were treatment after failure (TAF) cases. Out of total 201 cases 107 (53.23%) were males and 94 (46.76%) were females. Chi-squared test was applied to find out the effect of TB on gender. The value of $P=0.51$ that is >0.05 is none significant shows that Tuberculosis has no selective effect on specific gender. Pulmonary cases are 131 (65.17%) in number with 81 bacteriologicalley positive and 50 clinically diagnosed negative cases. Extra Pulmonary cases are 70 (34.82%) in number with 1 bacteriologicalley positive and 69 clinically diagnosed negative cases. The population detail of district Sudhnuti and individual population detail of all tehsils during year 2019 as provided by the planning and development department of AJK is shown in (Table 1). The complete detail regarding the total number of cases, number of male and female cases, pulmonary and extra pulmonary positive and negative cases and new, relapse and treatment after failure (TAF) cases of district Sudhnuti and all tehsils during year 2019 are shown in (Table 1). In year 2019, total 107 males were observed and in 0-4 age group 0 (0.00%) case was falling, in 5-15 age group 0 (0.00%) case was falling, in 15-24 age group 27 (25.23%) cases were falling, in 25-34 age group 29 (27.10%) cases were falling, in 35-44 age group 12 (11.21%) cases were falling, in 45-54 age group 9 (8.41%) cases were falling, in 55-64 age group 11 (10.28%) cases were falling and in >64 age group 19 (17.75%) cases were falling as shown in (Table 2). In year 2019, total 94 females were observed and in 0-4 age group 2 (2.12%) cases were falling, in 5-15 age group 8 (8.51%) cases were falling, in 15-24 age group 21 (22.34%) cases were falling, in 25-34 age group 14 (14.89%) cases were falling, in 35-44 age group 9 (9.57%) cases were falling, in 45-54 age group 7 (7.44%) cases were falling, in 55-64 age group 12 (12.76%) cases were falling and in >64 age group 21 (22.34%) cases were falling as shown in (Table 3).

3.1 Case Notification Rate

The case notification rate (CNR) of TB during 2019 in district Sudhnuti was 66. The details of total population, reported TB cases and CNR from 2014-2019 is given in (Table 4).

3.2 Contact Tracing and MDR Cases

Information about the total number of OPD cases, presumptive TB cases tested by AFB microscopy or GeneXpert, number of positive TB cases verified by GeneXpert, number of cases tested for MDR, number of MDR TB cases identified, number of bacteriologically positive cases whose contacts were screened, number of contacts of bacteriologically positive cases screened and number of TB cases identified by contact tracing during year 2019 are listed in (Table 5). In year 2019, 522 contacts of 82 bacteriologically positive cases were traced and 22 (10.94%) TB cases were reported by contact tracing. In year 2019, only 2 (0.99%) MDR cases were detected.

Table 1: Summary of TB Patients in District Sudhnuti during Year 2019

District Sudhnuti		Summary of all Cases of TB in Year 2019							Pulmonary			Extra Pulmonary		
Tehsils	Popullation	Total	M	F	New	Relapse	TAF	Total	+ve	-ve	Total	+ve	-ve	
Baluch	90774	54	32	22	48	4	2	31	20	11	23	1	22	
Mong	40588	8	4	4	8	0	0	4	3	1	4	0	4	
Pallandri	119866	90	45	44	81	7	2	57	46	11	33	0	33	
Tarar Khal	53528	49	26	24	49	0	0	39	12	27	10	0	10	
Total	304756	201	107	94	186	11	4	131	81	50	70	1	69	

Table 2: Age Wise Summary of all Male Cases in Year 2019

Age Group	Tehsil Balauch	Tehsil Mong	Tehsil Pallandri	Tehsil Trar Khal	Total
	Male TB cases	Male TB cases	Male TB cases	Male TB cases	
0-4	0	0	0	0	0
5-14	0	0	0	0	0
15-24	10	1	11	5	27
25-34	7	1	12	9	29
35-44	5	0	4	3	12
45-54	0	0	6	3	9
55-64	2	0	6	3	11
>64	8	2	6	3	19
Total	32	4	45	26	107

Table 3: Age Wise Summary of all Female Cases in Year 2019

Age Group	Tehsil Balauch	Tehsil Mong	Tehsil Pallandri	Tehsil Trar Khal	Total
	Female TB cases	Female TB cases	Female TB cases	Female TB cases	
0-4	1	0	1	0	2
5-14	2	1	3	2	8
15-24	5	0	11	5	21
25-34	5	1	4	4	14
35-44	2	1	2	4	9
45-54	2	0	3	2	7
55-64	0	0	8	4	12
>64	4	2	12	3	21
Total	21	5	44	24	94

Table 4: District Sudhnuti Population, Reported TB Cases and Case Notification rate from 2014-2019

Year	Population	Reported TB Cases	Case Notification Rate
2014	283268	248	88
2015	287962	281	98
2016	292733	285	97
2017	297584	282	95
2018	302435	235	78
2019	304756	201	66

Table 5: MDR Cases, Contact Tracing and Identified TB Cases by Contact Tracing in 2019

District Tehsils	Total OPD	Presumptive TB Cases Tested by AFB /xpert	B +ve Cases Identified Tested by xpert	Number of Cases Tested for MDR	MDR TB Cases Identified	B +ve TB cases whose contacts are traced	No of Contacts of B +ve Cases Screened	No of TB Cases Identified by Contact Screening
Baluch	31257	247	21	19	1	21	119	11
Mong	9658	46	3	3	0	3	17	0
Pallandri	76304	643	46	59	1	46	314	9
Tarar Khal	15850	122	12	12	0	12	72	2
District Total	133069	1058	82	93	2	82	522	22

4. DISCUSSION

In current study 201 TB cases were identified by microscopy and GeneXpert during the year 2019. The number of male TB cases was 107 and number of female TB cases was 94. The occurrence of pulmonary cases is high as compared to extra pulmonary cases. Out of 201 cases 131 were pulmonary and 70 were extra pulmonary. In current study the number of male TB cases was slightly higher than females. The male to female ratio (MFR) was 1.13:1.00. The MFR is different at different geographical locations of world. In certain regions, there is a higher incidence of tuberculosis among males, while in others, the prevalence of female tuberculosis cases surpasses that of males. The MFR can be different within the same country as in Eastern provinces of Pakistan, the MFR is 1.27:1.00 in Sindh, 1.12:1.00 in Punjab and in Western provinces the MFR is 0.70:1.00 in Baluchistan and 0.74:1.00 in Khyber Pakhtunkhwa [14]. The results of the current study are similar to study conducted by Saleem et al. (2013) in district Kotle AJK. The current study with respect to MFR shows similarity with Eastern provinces of Pakistan.

According to age group population was divided into different groups. During 2019 total 2 (0.99%) cases were falling in 0-4 age group, in 5-15 age group 8 (3.98%) cases were falling, in 15-24 age group 48 (23.88%) cases were falling, in 25-34 age group 43 (21.39%) cases were falling, in 35-44 age group 21 (10.44%) cases were falling, in 45-54 age group 16 (7.96%) cases were falling, in 55-64 age group 23 (11.44%) cases were falling and in >64 age group 40 (19.90%) cases were falling. According to current study the age group <15 is less prone to TB while age group >64 is more prone to TB. In current study the highest number of cases was found in age group 15-24. In current study individuals with age >14 are most commonly affected with TB. The frequency in children was found to be low.

CNR plays an important role in the control of TB cases but in current study the CNR was 66/100000. The TB incidence rate in AJK, as per WHO criteria for 2014, is 270 per 100,000, which is considerably high compared to other developing countries [12]. The CNR from 2014 to

2019 as shown in (Table 4) is far away from the WHO set criteria. The CNR from 2014 to 2019 shows an alarming situation with respect to surveillance system that may be not effective in reporting the exact number of TB cases or cases may be treated hiddenly without being registered.

MDR TB is a serious global issue and Pakistan is placed fourth in terms of the prevalence of Multi-Drug Resistant (MDR) cases [8]. The development of resistance to anti-TB drugs used to treat tuberculosis (TB), and chiefly multidrug-resistant TB (MDR-TB), has become a momentous public health threat in a number of nations and is a problem to actual TB control [15, 16]. In current study 2 (0.99%) MDR cases were diagnosed. On an average each individual spreads TB to 10 persons annually. In current study the ratio was low as during year 2019 22 (10.94%) TB cases were reported by contact tracing. The current study mainly focus on case notification that is main factor in cure and prevention of TB and on public awareness that plays an important role in reduction of the disease.

5. CONCLUSION

The current study shows that males are more prone to TB in district Sudhnuti AJK as compared to females. The individuals with age >64 are more susceptible to TB as compared to individuals with age <15. The CNR during 2019 is 66 that is far away from WHO set criteria. The CNR indicates that there is need of improvement in surveillance system. The current study mainly focus on case notification that is main factor in cure and prevention of TB and on public awareness that plays an important role in reduction of the disease.

CONSENT (WHEREEVER APPLICABLE)

Prior to enrollment, written informed consent was acquired from all participants, as well as from the parents or legal guardians of all participating children.

REFERENCES

1. Wazeer, A., et al., *Molecular Epidemiology of Mycobacterium tuberculosis in Division Mirpur, Azad Jammu & Kashmir*. LIAQUAT MEDICAL RESEARCH JOURNAL, 2021. **3**(1).
2. Parsons, S.D., M.A. Miller, and P.D. van Helden, *The Mycobacterium tuberculosis complex in Africa*. Tuberculosis in animals: An African perspective, 2019: p. 73-86.
3. Waksman, S.A., *The conquest of tuberculosis*. 2021: University of California Press.
4. Natarajan, A., et al., *A systemic review on tuberculosis*. Indian Journal of Tuberculosis, 2020. **67**(3): p. 295-311.
5. Peloquin, C.A. and G.R. Davies, *The treatment of tuberculosis*. Clinical Pharmacology & Therapeutics, 2021. **110**(6): p. 1455-1466.
6. Miller, T., et al. *Global epidemiology of tuberculosis*. in *Seminars in respiratory and critical care medicine*. 2018. Thieme Medical Publishers 333 Seventh Avenue, New York, NY 10001, USA.
7. Chakaya, J., et al., *Global Tuberculosis Report 2020—Reflections on the Global TB burden, treatment and prevention efforts*. International journal of infectious diseases, 2021. **113**: p. S7-S12.

8. Atif, M., et al., *Frequency and factors associated with adverse events among multi-drug resistant tuberculosis patients in Pakistan: a retrospective study*. *Frontiers in Medicine*, 2022. **8**: p. 790718.
9. Ullah, W., et al., *Public–private Mix models of tuberculosis care in Pakistan: a high-burden country perspective*. *Frontiers in Public Health*, 2021. **9**: p. 703631.
10. Munir, M.K., S. Rehman, and R. Iqbal, *Meeting the challenge, making a difference: Multidrug resistance tuberculosis in Pakistan*. *Pakistan Journal of Medical Research*, 2018. **57**(1): p. 1-2.
11. Hussain, M., *Is the public-private mix approach increasing tuberculosis case notification in Azad Jammu and Kashmir, Pakistan*. A cross-sectional study. figshare. Dataset, 2018.
12. Ilyas, M.T., et al., *Forecasting incidence prevalence of tuberculosis in Azad Jammu & Kashmir: a five-year retrospective study*. 2023.
13. Sulis, G., et al., *Tuberculosis: epidemiology and control*. *Mediterranean journal of hematology and infectious diseases*, 2014. **6**(1).
14. Dogar, O.F., et al., *Gender disparity in tuberculosis cases in eastern and western provinces of Pakistan*. *BMC infectious diseases*, 2012. **12**(1): p. 1-7.
15. Jain, A. and P. Dixit, *Multidrug resistant to extensively drug resistant tuberculosis: what is next?* *Journal of biosciences*, 2008. **33**: p. 605-616.
16. Khan, M.A., et al., *MDR-TB in Pakistan: Challenges, efforts, and recommendations*. *Annals of Medicine and Surgery*, 2022. **79**: p. 104009.

UNDER PEER REVIEW